SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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Original Correspondence.

BIRMINGHAM AND THE BLACK COUNTRY—No. V.

THE BLOOMFIELD IRONWORKS.

Three distinct works are classed under the heading of the Bloomfield Ironworks; they are the Bloomfield Works proper, the Factory Works, and the Tipton-green Works. All are situated at Tipton, near Dudley, and are the property of Messrs. William Barrows and Sons. These works are as large and have been longer established than almost any other in South Staffordshire. Few works in the world, perhaps, can boast the reputation they have earned for the general good quality of the iron they produce. The Bloomfield brand is known in almost every place where iron is used. The original title of the firm was that of Messrs. Bradley, Barrows, and Hall, but it is more commonly known as Barrows and Hall's, although those holding the names of both Bradley and Hall have long since ceased to have any connection with the works. Over 2000 men and boys are employed at the Bloomfield works, and the quantity of finished iron they are able to turn out per week is about 1200 tons. These works are of historic interest in connection with the manufacture of iron, for in them the late Mr. Joseph Hall made many valuable experiments, and accomplished several important improvements; a glance at these will be found interesting. Mr. Hall was one of the most experienced and skilful makers of wrought-iron that South Staffordshire has produced, and to him is attributed the invention of the "wet" puddling, or pig-boiling process. Some few years before his death he published a small work, entitled "The Iron Question: considered in connection with Theory, Practice, and Experience, with special reference to the Bessemer Process." In this work he lays down his claim to the invention of the process above referred to, for it may be as well to state that his right to be credited with it was disputed. However this may be, and granting that he was not the first to think of the process, there is no doubt that he was the first to develope and work it with success. The old method of puddling was carried out upon a sand bottom, in the furnace; but in Mr. Hall's procees these were done away with, and the iron bottom of the furnace was firstly coated with solid oxidised compounds of iron, and also with a thickness of liquid cinder, consisting principally of protoxide of iron. By using such "fettling" as we have described the boiling process was brought about, for the oxygen contained in the cinder, &c., decarburised the pig-iron, and caused carbonic oxide to be produced below the surface of the molten metal, and this, in its endeavours to escape, gave the appearance of boiling. Mr. Hall patented the invention of "bull-dog," or roasted tap-cinder, to be used for puddling-furnace bottoms, but his right to the invention is questioned. He roasted his tap-cinders in kilns. To facilitate the pig-boiling process, Mr. Hall designed an improved furnace bottom, formed of cast-iron plates, surmounted by projecting fire-bricks.

Mr. Hall, in his work, gives a few first-class rules for conducting the operations of puddling. They are as follows:—"First charge the furnace with good forge pig-iron, adding, if required, a sufficiency of flux, increasing or diminishing the same in proportion to the quality and nature of the pig-iron used. Secondly, melt the iron to a boiling or liquid consistency. Thirdly, clear the iron thoroughly before dropping down the damper. Fourthly, keep a plentiful supply of fire on the grate. Fifthly, regulate the draught of the furnace by the damper. Sixthly, work the iron into one mass before it is divided into balls. When thus in balls take the whole to the hammer as quickly as possible, after which roll the same into bars for mill purposes."

In describing the Bloomfield Works we will take first the larger portion, at which the head offices are—that is, Bloomfield proper. In No. 1 forge there is one forge train, one large halve or lifting hammer, and a large pair of shears driven by a cam. The engine to this forge works with a beam, and condenses the steam; the cylinder is 41½ in. in diameter, and the stroke 7 ft. The power, as estimated by the engineer of the works, Mr. Lester, is 116-horse. Steam is supplied from one firing and two furnace boilers. There are 14 puddling-furnaces in this forge. In No. 2 forge there is one train of rolls, a large helve, and a pair of cutting-down shears, worked by a cam. These are driven by a condensing beam-engine, having a cylinder 40¼ in. in diameter, and working a 7-ft. stroke; 127-horse power. The steam is obtained from five boilers, two of them being heated by the furnaces. The number of puddling-furnaces is 14, as in No. 1. No. 3 forge machinery is driven by a condensing beam-engine, having a cylinder 42¾ in. in diameter, and working a stroke of 7 ft. The horse-power is 150. The forge-rolls are worked from the end of the plate-mill. There is a very large helve, a pair of shears, and eight puddling-furnaces. Three boilers supply the engine with steam; they are all firing boilers—*i.e.*, heated with slack or small coal. No. 4 forge machinery consists of one train of rolls, and one helve. These are driven by a condensing beam-engine, having a cylinder 33½ in. in diameter, and working a 5-ft. stroke; the power is 64-horse. From this engine a blowing apparatus is worked, consisting of two cylinders or blowing-tubs, in which the pistons are moved by overhead double cranks; these supply blast to a small refinery. The above engine gets its steam from two firing boilers.

There are 10 puddling-furnaces in No. 4 forge. No. 5 forge, or the scrap side, is devoted to the conversion of wrought scrap-iron into bars. There are five ball-furnaces, having the old-fashioned sand bottoms, in which the scrap is heated. The condensing beam-engine in this forge has a cylinder 40¼ in. diameter, and works a stroke of 5 feet; steam is supplied from three firing-boilers. The machinery consists of one helve and a forge-train. No. 6 forge-engine is high-pressure, has a cylinder 18⅜ in. diameter, and works a stroke of 3 ft.; two boilers supply the steam—one of them is a firing-boiler, but the other, a wagon or egg-ended boiler, is heated by the waste heat from four puddling-furnaces. In this forge there are eight puddling-furnaces, one train of rolls and one helve. From the end of the forge-train is worked a "bull-dog" crushing-mill, in which the roasted tap-cinders are ground up, and prepared to be again used as "fettling." Coming to the mills, the first we take is the "big mill," a 14-inch or large merchant train; in this the heaviest bars made at these works are rolled. This firm do not roll very heavy bars. The "big mill" is driven from No. 1 forge engine. At the back of this mill there is a strip-mill and a slitting-mill. There is a Smith's steam-saw and one pair of shears, for cutting the ends of the bars. Two heating furnaces prepare the piles for the rolls. The 9-in. guide-mill, situated near the last-mentioned mill, is driven by a condensing beam-engine, having a cylinder 36½ inches diameter, and working a stroke of 5 ft.; three firing-boilers supply the steam. Near the guide-mill there is also a hoop-mill. There are two heating furnaces. No. 2 forge engine drives No. 2 "big mill" and a wire-mill, the latter being geared from the end of the former. Each of these mills have two furnaces for heating the iron. The top, or "Jerusalem" mill, is a middle-sized merchant mill, and is driven by a high-pressure beam-engine, with a cylinder 21½ in. diameter, and working a stroke of 5 feet; horse-power, 51; the steam coming from four boilers, three of them firing, and the other heated by furnaces. There are two heating furnaces and one pair of shears to this mill. The "new mill" or small merchant mill is driven from No. 5 forge engine; there are two heating furnaces and one pair of shears connected with it. The plate and sheet mills are driven from No. 3 forge engine. The slabs or blooms for the plates are worked under No. 3 forge helve before going to the rolls. There are four pairs of shears to these mills, two heating furnaces to the plate-mill, two also to the sheet-mill, and one annealing furnace. The two latter are excellent mills, and in them the firm turn out some first-class plates and sheets, for which they are particularly noted. For want of space we must leave the remainder of the description of these works until next week.

THE DUSKY REALMS OF THE IRON KINGS—No. IV.

BY J. RANDALL, F.G.S.

The demonstration at Dudley, in which a coroneted nobleman and distinguished ironmaster took part in the presentation of a handsome testimonial to a chief manager of a large mining property, is an event worthy of more than a passing remark. It is an event honourable alike to the noble earl who has done so much to raise the character of the South Staffordshire iron trade, and to the genius—which we might almost call hereditary—of Mr Smith-Shenstone, till now the manager of Earl Dudley's extensive mineral estates, and one which will stand out for years to come, as showing the falsity of charges which have been made of a want of sympathy between the chiefs and subordinate members carrying on those great industrial pursuits which distinguish the Dusky Realms of the Iron Kings. Handsome as the testimonial is in itself, its value is increased by the hearty goodwill of which it is the mute expression on the one hand, and the genial appreciation of services by which it was accompanied on the other. The testimonial consisted of a silver-gilt vase and four fruit and flower stands, manufactured by Messrs. Elkington, the whole weighing 1000 ozs., and costing 750*l*. The presentation took place at Dudley, the town selected in a former article as the fitting centre for our observations, and which may fairly be regarded as the metropolis of the surrounding district.

With such patrons, and such a staff of agents as Earl Dudley has been fortunate enough to press into his service, we need not wonder that it posseses so many valuable institutions. We have already said that it has what every mining centre ought to have—an excellent museum, in which are represented the varied mineral and geological features of the country, and particularly of those carboniferous and Silurian series of rocks which, in the neighbourhood of Dudley, are laden with its peculiar and beautiful fossil forms. It has also an excellent Geological Society, formed for the purpose of promoting the study of the geological features of the Midland district, and which dates its existence from a period when that science was far from being thought to be of the importance it is at present, and which it is not too much to say owes a large amount of its prestige to its able and indefatigable honourary secretary, Mr. Madeley. In consequence of arrangements made some short time ago, the Geological Society is affiliated to the Mechanics' Institution—the old collection of fossils being turned over to trustees in whom it is vested, so as to prevent its ultimate dispersion, and to preserve it for the use of the Institute and the town. In return for the pecuniary assistance which the members of the club render to the building fund, they have free access to the museum. Dudley is also the centre of the South Staffordshire and East Worcestershire Institute of Mining Engineers, of which Mr. Henry Johnson is the honorary secretary.

It would be out of place with our present intentions to enter at all upon the historical associations of Dudley, or to speculate upon the birth of the ever-growing and ever-varying industry of the place. Whether that distinguished Saxon chief, Dodo, who is said to have given his name to the place, and who built his castle here in the eighth century, was a patron of the local iron-workers (if any), or not, we cannot say. It is more to our purpose to remark that the Domesday surveyors tells us there was "one smith" here then, and that Dud Dudley tells us that there were 20,000 within a circuit of 10 miles in his day. Many of the present works occupy sites the names of which call up associations with the past; but in some instances the features of the place have been so changed that names appear misnomers; in others they remain, as in the case of Corbyn's Hall, an old mansion standing near the works. We select these for remark under the impression that for able management, efficiency of plant, and machinery they are probably not inferior to any in South Staffordshire.

The furnaces are leased by Mr. William Mathews, whose great ability and long experience have gained for him one of the foremost places in the councils of the ironmasters of the district; and, as evidence of the enterprise by which they are conducted, it may be stated that within the past 10 years the old furnaces, those former cumbrous piles of brickwork common to the district, have been pulled down, and three substantial iron-cased furnaces have been built in their place. The furnaces were formerly blown by one of Boulton and Watt's condensing beam-engines, with 42-in. cylinder and 8-ft. stroke, which was erected in 1824, and, in addition to this, another powerful engine has since been put up, with cylinder of 52-in. diameter and 8-ft. stroke; also a blowing-cylinder of 104-in. diameter. The average weekly make of each of the furnaces is 200 tons of pig-iron; and though this may be deemed a small make compared with the quantity made in the North, still, when the soft nature of the South Staffordshire coke is taken into consideration, it may be considered as a very high make, and one which is not exceeded by many furnaces in the district.

The quality of the pig-iron made here is a good sample of the better sort of hot-blast pig of the neighbourhood. These blast-furnaces were originally built, and worked for many years, by Messrs. John and Benjamin Gibbons, who devoted themselves to the development of this branch of their trade with indomitable perseverance, and who were far ahead of their neighbours in the practical experience which they applied, both in the consumption of the furnaces and in the mixture of the materials which they used for smelting. Mr. John Gibbons devoted a great deal of attention to the construction of the blast-furnaces, and it is not too much to say that the present shape of the interior of the furnaces is indebted more to his experiments and practical working than to the labours of any other ironmaster of this district.

In 1839 he published a small pamphlet, entitled "Practical Remarks on the Construction of the Staffordshire Blast-Furnace," which was reprinted in 1844. This pamphlet is very seldom to be met with, but a number of extracts from it will be found in Dr. Percy's "Metallurgy, Iron and Steel," from which it may be seen how much attention the author gave to this most important subject. Messrs. Gibbons also were among the first to see the importance of utilising the cinder or scoria from the puddling and mill furnaces, which was formerly only used for mending roads, though containing a considerable quantity of iron. Dr. Percy says that "Dr. Priestley states that his brother-in-law, Mr. Wilkinson, used with advantage a certain proportion of 'finery-cinder' in the smelting of iron" ("Metallurgy, Iron and Steel," page 742), but still these cinders were not generally used. One reason of this was, especially as to the tap-cinder from the puddling-furnaces, that the quality of the pig-iron was considered to be so much deteriorated that good finished iron could not be produced from it. If, however, we take into consideration the quality of the iron ores now used for smelting, especially those from the Liassic and Oolitic measures, we must conclude that the use of cinder is by no means so serious in its consequences, comparatively, on the quality of manufactured iron as it appears at first sight. Some time before 1834 these cinders were used by Messrs. Gibbons at the Corbyn Hall furnaces. They tried them with cold-blast, but did not succeed in using them economically until they introduced the hot-blast. The history of the first hot-air oven is still talked of in the neighbourhood; "it started in the morning, and was burnt down by tea-time," as we were told.

Dr. Percy says that Mr. John Dawes was among the first to see the importance of utilising the forge and mill cinders, and refers to a conversation he had with Mr. Dawes on the subject, about 20 years previously. But Messrs. Gibbons were making cinder iron more than 10 years before, and much credit is certainly due to them for the foresight they displayed in directing their attention to the economical use of this important product. It is almost impossible to predict what would have been the present state of the South Staffordshire blast-furnace trade had not this material been made use of. The small quantity of native ironstone now raised would not be sufficient to keep alight many of the furnaces, whilst the increased value of the ironstone would have added still more to the cost of production. Messrs. Gibbons leased the Corbyn's Hall Furnaces to Messrs. Mathews, of Dudley, in 1833 and 1836, and erected four other furnaces on an adjacent part of the estate.

The forge and mills at Corbyn's Hall were in the occupation of Messrs. S. Hingley and Co. They were erected in 1846-52, under the direction of Mr. William Wright, of Harts Hill, and are laid out with the most careful attention to economy of labour and convenience. They can turn out more than 300 tons of finished iron per week. There are 34 puddling-furnaces, and the forge train is worked by a low-pressure beam engine, with 44-in. cylinder; and a similar engine, with a rather larger stroke, works the mills. There is also a Nasmyth steam-hammer for the ball-furnace. The kinds of iron manufactured here consist of plates, sheets, rails, nail-rods, tees, angles, and merchant iron generally. The Corbyn's Hall new furnaces are now standing, but it is expected they will shortly be put to work again.

COLLIERIES IN NORTH DURHAM, THEIR WORKINGS AND MACHINERY—No. IV.

The Wardley Winning and Shipcote Colliery, in Gateshead, form the third section of mineral property under the ownership of Messrs. John Bowes and partners. The Hylton mineral estate of 2592 acres, adjoining to Wardley, is also leased by this company. This section of their property is under the mangement of Mr. A. S. Palmer. The total area of property belonging to, and leased by, the firm of Messrs. John Bowes and partners, in the Marley Hill, Killingworth, and Wardley groups is over 27,000 acres.

Wardley Winning.—The area under lease here is 700 acres; the coal field is in course of being opened out by the sinking of two pits to the Hutton seam in a central part of it, adjacent to the North-Eastern and the Pontop and Jarrow Railways. As explosive gas is the greatest enemy of the coal miner, so is water the great hindrance to the sinker in this district, the Wardley pits being situate outside the limits of the magnesian limestone formation, have not received the immense feeders which usually issue from this limestone and the sand underneath; still there have been heavy discharges of water from various beds of sandstone met with to the depth of 74 fms.—now stopped by cast-iron tubbing—which have greatly impeded the operation of sinking. The north pit is 13 ft. in diameter, divided by wood brattice, the smaller section being 3 ft. 9 in. of the whole diameter. The south pit is 36 yards distant from the north pit at their centres and 10 ft. in diameter. The Wardley pits were commenced and sunk to the depth of 42 fathoms by Messrs. Carr and Co.; they were stopped, owing to the appliances for raising water being unequal to the task of overcoming the feeders, which consisted of the large winding-engine, lifting the water with iron tubs. After standing 12 years the sinking of the pits was resumed in June, 1868, the lease having been taken up by Messrs. John Bowes and Partners. The surface plant at present consists of the permanent winding-engine at the 13-ft. pit, having been used hitherto for raising water; the intention is to erect a similar winding-engine for the 10-ft. pit, adjacent to the former. The other plant consists of two sinking engines—one for each pit, one crab engine, six boilers and boiler feeder; two ground crabs at 13-ft. pit, one cradle or walling crab for each pit, shear legs 75 ft. in height, and temporary pulley-frames for winding in the pits. The 13-ft. pit is at present sunk to the depth of 160 fathoms, being 8 fathoms short of the Maudlin seam; the Hutton seam will, probably, be got at the depth of 184 fathoms. The 10-ft. pit is sunk to the depth of 144 fathoms; the High Main seam was passed through at the depth of 140 fathoms, and has been par-

tially worked from this pit; the seam is divided here by several feet of shale. The 13-ft. pit is secured by walling and cast-iron tubbing from the surface as follows:—

1.—Ashlar walling	3	fathoms.
2.—Tubbing	12	,,
3.—Fire-brick walling	8	,,
4.—Tubbing. Wedging curb.	9	,,
5.—Tubbing. Wedging curb.	22	,,
6.—Tubbing. Wedging curb.	19	,,
7.—Tubbing. Lowest wedging curb.	1	,,
	= 74	fathoms.

Below this depth the pit is secured throughout by fire-bricks, made to suit the circle of the pit, and 9 inches in the bed. The water-bearing strata behind the tubbing consist of thick beds of sandstone, these being alternated with beds of shale. Since the sinking was resumed the water has been raised by the large engine, with pumps 14 in. diameter of bucket, in one lift, hanging from two ground crabs and their ropes, and five-fold blocks. This has enabled the feeders to be overcome by the same engine power as before, and not driven to its maximum speed. Wedging curbs and tubbing have successively been inserted, until at last the hanging lift was 73 fms. in height. The large winding-engine has one 60-in. cylinder, 7-ft. stroke, cast-iron levers, air pump, and condenser; 18-ft. flat wire-rope drums; 24-ft. fly-wheel, and foot-break. The front lever by a connecting-rod works the pumping beam below. The house and intermediate wall are built of ashlar stone. The pumping-beam works over the pit at one end, and at the opposite end over a staple within the house; the stroke at each end is 5 ft. 3 in. This arrangement causes the engine to be much too near the pit. The pumps are now removed from the pit. By a lift of pumps in the staple of 30 fms., 14-in. bucket, the engine raises water for condensing and other purposes. Tubbing is also inserted in the staple, corresponding to that in the pit; the water to supply the pumps is let off from behind the tubbing by cocks. At the depth of 32 fms. in the pit a drift was driven over under the staple, and a bore-hole is put down from the bottom of the staple to this, which forms another supply of water from behind the tubbing of the pit to the pumps placed in the staple. The thickness and strength of the tubbing in the pit increases with the depth; at the depth of 73 fms. the thickness of metal is 1¼ inch. Small pipes, 2 in. in diameter, are inserted at this depth, and carried up the pit to the highest water-level, about 300 ft.; this gives a pressure at the bottom of the tubbing of 130 lbs. per inch. The tubbing inserted in the ten-feet pit corresponds very nearly in depth with that of the thirteen-feet pit. Below the depth of 74 fms. the water in both pits has been raised by the sinking engines in tubs.

The sinking-engine at the thirteen-feet pit has one 20-inch horizontal cylinder, 4½ ft. stroke; wheels in ratio of 1 to 3; two drums, 6 ft. in diameter, on one shaft—only one drum now used—and fly-wheel; brake both on fly-wheel and drum. The sinking-engine at the ten-feet pit is similar in its parts to the preceding, with one 6-ft. drum and fly-wheel; the two engines are designed to form a double hauling-engine for the mine. The crab-engine has one 14-in. horizontal cylinder, 3-ft. stroke; two pairs of wheels, in ratio of 1 to 5, for the jack-drum, which is 3 feet in diameter, and put in or out of gear by a clutch; other two pairs of wheels, in ratio of 1 to 4, move the crab drum, which is 4½ feet in diameter, and is put in or out of gear, as required, by slide-carriages. The crab-rope is of galvanised iron-wire, 6 in. in circumference. Six plain boilers, 40 by 6 ft., supply the engines; these are hand-fired, wheel-flued, and covered with brickwork. Three of the boilers supply the condensing-engine at 25 lbs. pressure, three others supply the three non-condensing engines, at 35 lbs. pressure. The boiler-feeder is one of Tangye's horizontal "special" pumps. The boiler-feeder also forces water into a cistern at the top of the engine-house, the supply being obtained from that raised in the staple. This water being pure, and not saline, is distributed by pressure in pipes to the dwellings in the vicinity of the pits. The Wardley pits are sunk on the north side of the Heworth dyke, which throws the measures down to the north 25 fms. As is usual with faults of magnitude, considerable alteration takes place in the quality of the coal seams on the respective sides of it; these are generally found to be of better quality, and greater thickness, on the north side than on the south side of the Heworth dyke.

SHIPCOTE COLLIERY.—About 1000 acres of property is attached to this colliery, of which Mr. A. Ross is viewer. The present coal pit had been sunk to the Hutton seam, and, after standing 80 years, was resumed 15 years ago in the same seam. Numerous evidences of ancient workings exist in this locality. The High Main seam is found 6 ft. in thickness in Shipcote pit, at the depth of 11 fathoms; this would, no doubt, be the first to be attacked, and when abandoned thin pillars would be left, as was the practice of the old miners. The lower seams down to the Hutton seam have only been partially worked. The old pillars of the Hutton seam in the Bensham district are found to be 20 yards by 3 to 5 yards in width, the bords 3 yards, and the walls 1½ yard in width; these, as a rule, are not "crept" pillars, where the cover does not exceed 30 fathoms; where the cover increases to 60 or 70 fathoms, the workings show more or less of the heaving floor. The Shipcote coal pit is 8½ ft. in diameter, and downcast; the upcast is 8 ft., and 40 yards distant; this with a furnace near the bottom of it is the ventilating agent, the circulation being accelerated by the escape steam from two underground engines. The winding-engine is a 25-inch beam-engine, 5½-ft. stroke, direct-acting, 9-ft. cylindrical drum. Four plain boilers, three 30 by 5½ ft., one 40 by 5 ft. supply this, and two underground engines with steam at 35 lbs. pressure, these are enclosed in a shed; the boiler feeder is an 8-in. engine, with 6-in. ram.

In consequence of the drowning out of Oakwellgate and Gateshead Park Hutton seam workings, some years ago, the Shipcote Hutton seam workings also became drowned. The "hanging-on" was then made at the Maudlin seam at 60 fathoms depth, the main road into the mine is formed in that seam for 350 yards westward, rising about 2 in. per yard. By a stone drift in the same direction dipping 12 in. per yard, the Low Main and Hutton seams are intersected; the main road continues in the Hutton seam from the bank foot, first southward, then turning westward for a length of 1700 yards; this length forms an engine plane, worked in and out by a hauling-engine and clip-wheel. At the turn to the west there is a station or stopping-place, which is supplied by five horses. The hauling-engine placed in the Maudlin seam, 30 yards west of the pit, has two 12-in. horizontal cylinders, 2-ft. stroke, wheels in ratio of 1 to 4; it works by a 4-feet clip-wheel, and wire-rope the 1700 yards length of plane, both in and out, 24 tubs at once, the rope ends being attached to the front and back of the train. On the same shaft with the clip-wheel is a 4-ft. drum, put in or out of gear by a clutch; while the engine is hauling the set outwards in the 1700 yards length by the clip, at the same time it hauls a set of 24 tubs inwards along the length of 350 yards—from the shaft to the top of the stone drift—by means of the drum, and a return wheel at the top of the stone drift; when the drum is put out of gear, the set of 24 tubs run outwards this distance to the shaft by their gravity.

The 100 yards length of stone drift is worked by the pumping engine; it hauls up eight tubs at once, the empty ones running down by gravity. At the west extremity of the engine plane a 5-ft. return clip wheel is placed horizontally. On the shaft of this wheel a vertical drum, 2 ft. 9 in. diameter, with clutch, is intended to be fixed, to haul from the north 300 yards, by a chain. The tubs will run down to the north by gravity. Five horses and fourteen ponies are employed, also, in the conveyance of coal throughout the pit. The pumping engine is placed about 20 yards south from the hauling engine, has two 18-in. horizontal cylinders, 3-ft. stroke; it works direct two double-acting pumps, 6-inch plungers, 3-ft. stroke goes day and night at the rate of 26 strokes per minute, and can perform with ease 35 strokes; it forces water up the pit in 8-inch mains, 14 gallons per stroke; 26 strokes will deliver 360 gallons per minute. This engine also hauls up the stone drift, as described, by 4-ft. drum, with wheels in ratio of 1 to 3, when the pumps are stopped. Steam for the two engines is brought down the pit in 10-in. pipes, and from thence in smaller pipes to a receiver, from whence the engines are supplied. The escape steam from these is brought in pipes to the bottom of the upcast pit. The furnace for ventilation is 6½ ft. in width, 25 yards from the pit; 30,000 cubic feet of air is in circulation through the mine. The Maudlin seam, as found here, is 3 ft. 6 in. thick, including two bands in it. The Low Main seam is 3 ft. 4 in. of clean coal, with good roof, has lately been proved in the south district, and is intended to be worked on the long wall system. The Hutton seam, now worked in the south and Bensham districts, is from 5½ to 6 ft. in thickness of clean coal, roof not good, inferior fire-clay beneath. It is worked on the bord and pillar system; the pillars are made 30 by 14 yards, bords 4, walls 2 yards in width. The cleavage runs nearly north and south; the bords are driven at right angles to this, either east or west, in panels of twelve, and the pillars are subsequently worked off homewards, on the completion of the whole working. Lamps are used exclusively in the workings inwards of the stone drift; these are the Davy and Clanny lamps. The engine plane, in a part of its course, is made through old workings and pillars, more or less in a state of "creep;" from these workings gas is liable to be thrown off irregularly, not being properly accessible for ventilation; the exclusive use of lamps has, therefore, been adopted as a precautionary measure. About 250 tons of coal is raised daily at Shipcote pit, of the Hutton seam, the whole of which is conveyed away in carts, and vended in the town of Gateshead.

THE SUPPLY OF COAL IN SOUTH STAFFORDSHIRE.

SIR,—In the Supplement to last week's Journal is given an ample account of my views respecting the Codsall Wood and Chillington sulphur springs, but from some misconception of what I said I find myself therein committed to the views expressed in the following passage:—"That sulphur springs were not due to any local causes, but were caused by water collected at some given point, and then percolating through strata of coal, *and were, therefore, to be regarded as indications of the existence of coal measures.*" The expression of such an opinion would be to render utterly valueless all that I have written upon the subject. So far from any such view emanating from me, I pointed out in my first paper that sulphur springs occurred in many geological formations, and spoke of the Silurian, carboniferous limestone, lias, &c., as producing them, but in all those cases they are traceable to the decomposition of iron pyrites, or sulphuret of iron. I fully believe that the coal measures exist beneath the Trias and Permian and Codsall Wood and Chillington; whether or not they include the Lower as well as the Upper coal measures is yet doubtful, because of the denudation indicated by the Symon fault of Shropshire. I consider the sulphur springs there to be connected with the coal measures, because they contain large quantities of pyrites, whereas it does not appear that the Trias and Permian do, to such an extent at least, as to affect the water contained in them.

But my principal reason for believing coal measures to exist there is that the correlation of the coal measures of Shropshire and Staffordshire is so obvious that it is impossible to suppose they were not originally deposited continuously between the two districts.

Stiffnal, Jan. 11. DANIEL JONES.

COAL IN SOUTH AFRICA.

SIR,—As the subject of South African Coal is of great importance to the Colonists, and of high interest to geologists at home, I send you some extracts of letters referring to the coal of the Stormberg, near Queenstown, which is of Mesozoic (Secondary) age. The coal of Lower Albany, with its *Sigillaria, Lepidostrobus, Halonia, Selaginites*, &c. (Bristow's report), is of Palæozoic (Primary) age, and, of course, quite different in its relations and locality. The coal quoted from Tulbagh, in the south-west, not far from Cape Town, seems to be mere alluvial lignite, according to some reports.

Mr. C. Evans, of Queenstown, who is working some of the Stormberg coal on a farm he has, writing to Dr. Atherstone, of Grahamstown, in July, 1869, remarked:—"The coal I am now working is five and a-half hours' ride from Queenstown, to the west of Bushman's Hoek (see Hall's Map of the Eastern Frontier), about one and a-half hours' ride directly north of Queenstown. You find plant-impressions and a kind of plumbago along the road, on a farm four and a-half hours' ride from Queenstown. The road to the Stormberg is very good, and the road over the mountain is in excellent order. From thence we have a fine level country off to the Free State, Colesberg, and Hopetown. Queenstown is a fine horse and grain country. The Stormberg country is far superior, and produces large quantities of wool, and the finest wheat and potato crops in the colony; but a hundredth part of what might be produced is not grown, because we cannot sell on the spot, and the expense of transport is too great to send it elsewhere.

"The coal is not only on the farm I am working, and at Mr. Vice's, about three hours' ride beyond it, but it is found cropping up along the country for a distance of 80 miles or more, in larger or smaller quantities. I also found it in a more easterly direction, towards the sources of the White Kei, some eight years ago, and also near Dordrecht, where there are fine large fossil trees, 3 or 4 ft. in diameter, with roots and leaf-impressions in the shale and sandstone. Between Dordrecht and the Bushman's Hoek, along the mountain range, but on the western side, is a red sandstone, with numerous fossils of large animals; and near by, in a fragment of grey sandstone, detached from the "krantz" (precipice) I found the bones of an animal as large as a springbok. [These fossil bones are, probably, remains of the *Dicynodon* and other large reptiles common in this so-called "Karoo Formation" of South Africa.]

"GROVE'S COAL.—That reported to be near the house is of an inferior quality, but burns and retains heat a long time. The section of the "kopje" (hill) near the house shows coal between two layers of basalt at the top, with sandstone, shale, and sandstone below. About three miles off, on the same farm, another coal lies between shale and sandstone, with numerous impressions of plants.

"BUSHMAN'S HOEK COAL is good, in numerous thin seams; the main seam is 2 feet thick, and discoloured with iron.

"VICE'S COAL is on a small ridge, or "kantje," with this section:—

Sandstone (at top).		Coal	9 in.
Clay	3 in.	Clay	12 in.
Coal	4 in.	Coal	14 in. to 18 in.
Shale	4 in.	Sandstone.	

This mine is driven into the hill, with nearly horizontal parallel galleries, 120 ft. and 70 ft. long, with a crossway of 30 ft., and side cuttings. This coal burns well in stoves; it is used in Scott's steam-engine at Queenstown, and is supplied to the jail at Burghersdorp.

"OTLAH OR EVANS' COAL.—This is about half-way up the southern side of the mountain (Stormberg), and the road, though difficult, will soon be made. The seams run along the side of the mountain, above a sandstone bed, for some miles. 'Ironstone' (basalt) caps the mountain, and a band of it lies also not far above the coal, which has this section (downwards):—

Shale	6	ft.	Shale	4	in.
Coal	5	in.	Coal	3	in.
Yellow clay	1½	in.	Shale	1½	in.
Coal	5	in.	Coal	4	in.
Shale and coal	5	in.	Shale	2	in.
Pipe-clay	1	in.	Coal	7	in.
Coal	4½	in.			

It is in an exposed position, and has been damaged at the surface by water from the mountain, but improves within. The strata are throughout nearly horizontal, or with a slight dip, perhaps 7½° north-east. Some parts are very much intersected by trap-dykes, running in every direction."

Dr. Atherstone, writing from Grahamstown, in September, 1870, observes—"People here call the coal 'lignite,' but it produces no brown colour with *liquor potassæ*, and is highly bituminous. Where the coal of the Stormberg lies between sandstones (instead of shales or clays), perhaps the gases have escaped more or less freely. Here and there the greenstone dykes have changed the coal into anthracite, and even into graphite, at some places, it is said; but at one place a greenstone appears to have run *over* the coal beds without having changed them. I saw a fine bed of calamites [*? Phyllothecæ*] 80 or 90 ft. below the Stormberg coal, and great quantities of other plants (Ferns, &c.), above it. Some of these were apparently *Palæoamiæ*, too brittle to get out, but like those near Geelhoutboom, on the Sundays River (see 'Journal of the Geological Society of London,' vol. xxiii., page 144, plate 5), where also a peculiar coal appears in thin seams. These fossil plants of the Sundays River are of Jurassic age, and the Stormberg coal may be either of Triassic or Jurassic age."

T. RUPERT JONES.

STEAM-BOILERS.

SIR,—The corrosion of steam-boilers is, or has been, a source of great expense to railway, mining, and other companies employing steam. I lately met, in London, a gentleman who is engaged under the Great Western Railway Company, who informed me that the company have been enabled to save very largely in boilers by the adoption of the following recipe for a composition which is applied to the water after each cleansing, which occurs once a fortnight:—The constituents are 56 lbs. common soda ash, 28 lbs. soda crystals, 14 lbs. common black-lead, and 14 lbs. common wood charcoal, mixed together. I think it would be well for the managers of our mines, &c., to make the experiment of its use, it having answered so well on the Great Western Railway.—*London, Jan.* 11. R. SYMONS.

PROTECTION OF INVENTIONS AT EXHIBITIONS.

SIR,—I am glad to see our old friend Mr. F. W. Campin again at work for obtaining a Reform of the Patent Law, and hope he will not let the matter rest until the Patent Office is abolished, and the registration of mechanical inventions as well as designs inventions made legal. The author of a book, no matter whether useful or useless, has only to go to Stationers' Hall, buy a form for one penny, fill it up, and hand it to the clerk in attendance, with a five shilling fee, when he receives protection for forty-two years, or at the rate of exactly 1½d. per year. No questions are asked as to the utility or novelty of the book, and the author can employ all the funds at his command to advertise and press the sale of the book. In this way the author gets an enormous income without being dependent upon a capitalist at all, or if the book is worthless he can but lose the cost of manufacture (for to my mind most books are quite as much manufactures as chairs and tables), and the 5s. 1d. paid for protecting it. This outlay does not ruin or impoverish him, and he can, therefore, begin again, make another book, and try to be more successful.

Compare the happy position the author thus occupies with the lamentable position of the inventor, who is mulct by the capitalist, mulct by the Government, mulct by the patent agents, and mulct by the public. As Mr. Campin has abandoned the patent agency, we may now hope that he will more than ever look to the rights of inventors, and never rest until he has obtained them protection for 1½d. per year, including agents' fees. There is no reason why inventors should not be as well and cheaply protected as authors, for inventors do much more good to the country than authors, and worthless inventions are much less dangerous to good morals than worthless books, because worthless inventions do but sink into obscurity, while one worthless book may contaminate a whole community. For my own part I shall never be satisfied until we have simple registration of inventions at a fee of not more than 5s., and protection for forty-two years, as in the case of books. Let us see for a moment the position of the inventor at present, and compare it with that of the author, commencing with the same amount of cash in hand—say, 200*l.* The author prints his book at the cost of 150*l.*, protects it for 5s. 1d., and has 50*l.* to advertise it, and make it known. By the time his 50*l.* are expended his profits are coming in, and of these he spends part in further advertising, and part in supporting himself, so that his income constantly increases, and he becomes independent. But what would be done by an inventor in the same position? He would expend 150*l.* in making a working sample for the necessary experiments with his invention, and the remaining 50*l.* would be taken by the Government and his patent agent; for although some agents profess to do the work at lower rates the charge is only taken off one item and put on another, so that by the time the 25*l.* fees have been paid to the Government the patent agent's charges amount to about another 25*l.*, whether a respectable or a low-priced agent be engaged, so that low-priced agents had best be avoided.

But I would not engage agents at all; they do little for the inventor, and add much to his expenses and difficulties. The deposit of highly finished drawings is a mistake, as a practical man can understand a rough one as well if not better, and if rough drawings were the rule, instead of the exception, it would be an advantage to the inventor. So would it be an advantage if each inventor were compelled to describe his own invention in his own language. I declare that I have had specifications deposited for me that, without the patent agent at my elbow to explain what he meant, I should not have considered referred to my invention at all. And this was done by an agency at the West End of London, and well connected with inventors. I hope Mr. Campin will assist us to render the deposit of the inventors' original drawings and descriptions compulsory, and now that he is not a patent agent, I should think he could do so. It is, I believe, the unintelligible wording of the descriptions and the elaborate drawings that prevent an inventor proving his right to his invention if he unfortunately gets into a court of law. His patent agent uses language unintelligible to himself, and the poor inventor in trying to prove that he and his agent are referring to the same invention gets confused himself and confuses everyone else, from the judge to the doorkeeper, and so the verdict is given against him. If Mr. Campin could get an Act of Parliament to secure an inventor protection for (say) only twenty years, upon depositing his original drawings and description of an invention, and paying a 5s. fee, he would confer a boon upon a most useful class of his countrymen, and would entitle himself to the presidency of the Registration Office established to carry the system out.

Jan. 9. INVENTOR.

NANTEOS CONSOLS—MINING AS CARRIED ON IN CARDIGANSHIRE, CONTRACTING, ETC.

SIR,—Seeing the dilemma that this property is placed in, it will be well, under any circumstances, to let all the shareholders have some notion of how we now stand. At first, as at present, the mine was divided into 12,000 shares, 6000 of which were paid for the properties Bwlch Gwyn and Penrhiw, and the remaining 6000 were to have been issued at par, or 1*l.* per share, out of which 1*s.* per share was to be allowed as commission for selling: 2000 out of the 6000 were speedily issued at this figure, and the shares rose in the market to 26*s.* each. I was offered this price for mine, and I refused it.

In first starting the mines there was a wheel and drawing-machine on the Penrhiw portion of the property, and from the great opinion entertained by the then agent, Capt. Barbery, it was thought advisable to press on the 26 fm. level towards some ore ground which had been worked under the 16 fm. level. No sooner was the 26 started than lead ore was discovered in such quantities as would entail on the working of it neither profit nor loss. This ore was exaggerated in reports made to be worth 3 tons per fathom, and confirmed by parties who then seemed to be all honey, but which honey, to suit their own purposes, has recently turned to vinegar. On the strength of this discovery, therefore, a crushing-mill was at once ordered, together with a great deal of dressing machinery, on this part of the mine, the cry then being for returns and profits. Before the dressing-floors were half complete dressing was commenced, and—I speak from what I saw myself—one-half of the ore went away in the refuse and water, and that saved cost more than double what it should have done had a competent man been engaged as a washer. Not content with the riches of the discoveries in the 26, nothing would do but an immense quantity of ground was stoped away here, there, and everywhere; in fact, nothing but riches abounded, and, as a matter of course, all the agents who were before engaged were put down as a set of idiots, who knew not what they were doing. During all this time nothing was done by the Bwlch Gwyn Mine, the very thing that we started for, excepting on a lode at surface (on, of course, a great discovery by the agent). This lode was to be, in fact, a lasting monument to his great abilities as an old and experienced mine agent, and was accordingly christened "Barbery's Lode." This discovery ran away with considerable sums monthly, the underground work being entirely neglected.

To sum up, however, things turned out so very unsatisfactory that our agent had the good discretion to resign, and immediately things grew from bad to worse, so that we could by no means say with Lord Byron—"'Twas wonderful how things kept on improving." Parties began to grow sick, and the price of shares began to fall; and, true to the old custom of kicking those who are down, some gentlemen, I suppose, saw how matters were, and began to kick with a vengeance. This so frightened the generality of the shareholders that shares could not be got rid of at any price. It was obvious that if the Bwlch Gwyn part of the property was not placed in a position for making returns that the property must go to the dogs or cats, whichever you please, and accordingly operations were commenced. A good wheel and crusher, with drawing-machine and dressing apparatus, were completed, and the mine is now in a position to begin to make returns and profits. To carry out this work a debt of about 750*l.* has been contracted, which, if paid and only 300*l.* laid down for future working, would bring the Nanteos Consols into a dividing-paying concern. There is not a mine in the county of Cardigan so near being one as this, save its neighbours—the Powell United and Bwadrain. There are hundreds—aye, thousands—of tons of lead ore over the 30 at Bwlch Gwyn, that could be wrought with proper management, including expenses of every kind, at 7*l.* per ton; whilst the 46 fm. level is now in good ore, and must pass through the richest course ever worked in the mine for the next 50 fms., and which must leave large and lasting profits. The engine-shaft at Penrhiw is 30 fms. under this, and by employing the wheel for pumping a level at that depth may be extended the entire distance through the Bwlch Gwyn sett, which would pass under all their ore ground, and would lay open not less than 50,000*l.* worth of lead. If we get over our present troubles, I should propose that all the bargains should be let to responsible parties by contract. We could then make no mistake either in expenditure or returns, and I am certain a successful result would follow.

I have now said my say. If the shares were ever worth 1*l.* each they are worth

2l. now, and will give in less than twelve months time 25 per cent. on the latter figure. This is a case which seems to happen sometimes, and which also seems unavoidable, but whoever tries the property will find that what has been stated will be verified.

I am now carrying out a contract for the erection of a powerful wheel, with drawing and pumping apparatus, surface buildings, and to sink an engine-shaft, 30 fms. deep, 10 ft. long, by 6 ft. wide, for a sum of 50l., and, so far as I have proceeded, I would much rather do the work in this way than as a paid agent; in fact, a man who understands the country, his contract, and what he contracts for is safe, and will make more money in this way than he could possibly do by the present salary of agents in double the time.

I know, Mr. Editor, in the interest of the shareholders here, and of mining generally, that you will insert this in this week's Journal, otherwise it will be too late to do so.—*Goginan.* ABSALOM FRANCIS.

MINING ON LAKE SUPERIOR.

SIR,—The HENWOOD MINE is about one mile from the Calumet, working with about 85 miners, driving 20 heads of stamps, and the necessary preparations are being made for the erection of 30 more, to be connected with the first 20. The lode is a continuation of the Calumet and Hecla, being from 3 to 4 ft. up to 12 ft. wide, and may be estimated at an average of 7 to 8 ft., and, not unlike most all other lodes, has both profitable points and poor runs of ground. It is considered by several competent judges that by an additional 30 heads of stamps, and a continuation of more ground being opened, by the assistance of the second hoisting-engine, which will be ready by New Year's Day, that the mine will not only be in a paying state, but be earning profits, which the company well deserve. Their machinery is being erected most substantially, keeping in view the most recent improvements. For instance, they have in hoisting railroads in their shafts, and the cars so constructed as to empty themselves at a given point, and by the engineman having a mark tied to the rope they need no lantern day or night. In the mine the cars pass below the level sufficient for them to come out through the levels to empty into it; this also effects the saving of the cost of fillers. This company has a location a short distance from the Hecla, on the south-east side, which by sinking, it is said by reliable authority, the lode will pay expenses. Having every appearance of proving a valuable property, it is likely they will go on spiritedly to see what is there.

At the Calumet and Hecla they fell back last month to 735 tons jointly, owing to having dispensed with a shaft in the course of the month, and delayed operations seriously by bringing another shaft into a working state. We further learn that in future there will be no trouble in realising 800 tons a month, of their usual percentage—about 80 per cent. The south-east end of the Hecla is poor, by the coming in of a slide, but by going from 1200 to 1500 ft. further south-east, in sinking a couple of shafts, they have the lode as rich as in any part of the old mine.

I shall treat a little on Ontonagon mines in a future letter. There are as good mines there as in any other point of Lake Superior—Calumet and Hecla excepted. CORRESPONDENT.

Houghton, Michigan, Dec. 18.

[For remainder of Original Correspondence see to-day's Journal.]

MINING IN COLORADO.

COLORADO.—It is believed that the new Grand Island district will prove the most extensive as well as the richest silver district in the territories. Great preparations are making for next season's operations. Several London capitalists had arrived in Denver, and purchased claims at high figures. Some transactions have been as high as $150,000. The product of the region since the discovery, six months ago, has been $225,000. The Cariboo Mine yielded $75,000 in two months. The other principal mines are Idaho, Boulder, Sovereign People, and Trojan. On Dec. 15 one bank at Central City shipped 600 ozs. of gold, worth $10,000; 245 ozs. were from the California lode, 100 ozs. from the Rhoderic Dhu, and the rest from Prize, Tieke, Gardner, and Kansas lodes. The Golden City Mineral and Land Company raised 369 tons of coal from one shaft during November. The Hazleton Coal Company have put in a new coal shaft, and have 9 feet of solid coal. This is at the present terminus of the Colorado Central Railroad. The stamp mills at Black Hawk are all at work, and have plenty of ore on hand. They are digging for coal at Greeley, on the Denver Pacific Railroad, midway between Denver and Cheyenne. The Godfrey coal mines on the Kansas Pacific Railroad, east of Denver, have been abandoned as worthless. Permission has been granted to a company to mine for coal within the corporate limits of Denver.

UTAH.—The two Cottonwood canons, the principal districts being the Tintic, Star, East Canon, and Parley's Park, shipped for the year ending Dec. 1 $1,300,000 in silver ore. The most of this was taken out during last half of the year. The total gold and silver product of Utah for the year is placed at $2,125,000. Brigham Canon has yielded about $400,000 in placer gold the past season. Omaha has established works for smelting Utah ores. The ores at present go to San Francisco, Newark, N. J., and Swansea. Smelting works are being erected at Salt Lake City. The proposed extension of the Utah Central Railroad from Salt Lake to Denver will open one of the best coal regions in the territories. The census, just completed, places the population of Utah at 100,000, and that of its chief city, Salt Lake, at 14,000. The Meadow Valley mines, near Pioche, are turning out rich, the shipments averaging $25,000 per week.

NEVADA.—Bullion shipments for the last half of the year from Wells, Fargo, and Co.'s office, at White Pine, were 900 bars, valued at $1,586,000, exclusive of base bullion. The stamps mill at Eberhardt City is nearly ready. It is owned by an English company. The Mineral Hill silver mines have shipped several car loads of ore to the Omaha Smelting Works, which have just gone into operation. Some of the specimens assay very high—for instance, Argentine Mine, $600 per ton; Keystone, $400; Issahickson, $600; Austin Ledge, $4000; Monroe Ledge, $600; Norman Mine, $500; Grant Ledge, $600; Star of the West, $900; Grey Eagle, $600; Lost Lead, $500. The new quartz mills at Mineral Hill crush 15 tons of ore per day, and their capacity is to be increased. These mines shipped $60,000 in bullion to New York last month. The best mines in Nevada are now worked by English capitalists, who are developing the resources of that State in a thorough and systematic way, and the yield of 1870 will be largely in excess of that last year. The census, just complete, gives Nevada a population of 44,686.

MONTANA.—Eastern Montana is likely to settle up rapidly by colonies the coming year. The gold regions will be largely developed—those on Clark's Park, of the Yellowstone, are now the most promising in the territory. Parties from Dacotah and Colorada are already prospecting and buying up claims. Govenor Ashley, with whom your informant has just conversed, put the bullion product of Montana for 1870 at $14,000,000. The census, just completed, gives the territory a population of 20,594. Helena, Virginia City, and Bozewan, principal towns, are all growing rapidly. The shipments from Helena, the mining centre, since January 1 have been $10,000,000.

MISSOURI.—The Dun Mountain region is sending larger shipments of ore to St. Louis and St. Pittsburgh than before. The iron mills at South St. Louis are all in active operation. The tin mines of South-East Missouri, from which so much was expected, turn out worthless. Bidwell's Plate-Glass Works are now to be established at St. Louis. The East St. Louis rail-mill, and the Bellville nail works are supplied with Pilot knob iron ore and Southern Illinois coal. The Potosi Lead Works show a larger yield than in any previous year. The Lewis Ironworks, of St. Louis, have contracted to manufacture the iron work for 500 freight cars; it will take 3000 tons of iron. The iron and coal will be Missouri products.

ILLINOIS.—The miners of Illinois will hold a State convention at Bloomington on Jan. 4, to consider the measures necessary to provide for the health and safety of persons employed in the coal mines of the State, the design being to petition the next General Assembly of the State to pass proper laws. Pennsylvania passed such last year, and the miners in Ohio and Indiana are moving for the same. The coal mines of St. Clair county are shipping about 100 car-loads per day to St. Louis.

CALIFORNIA.—The correspondent of the Cincinnatti *Times* says:—"The only paying tin mines in the United States are at Temeschal, San Bernardino county, California. Though the ore yields 60 per cent. of tin, and was discovered 11 years ago, it has never been worked, because various contestants were on the coasts trying to obtain the five-league grant containing the mines. First, in 1854, Serrano, a native Californian, claimed the land before the Land Commissioners, and was rejected. Abel Srams brought the claim of Serrano's widow, and the United States District Court confirmed it, but his opponents took an appeal to the Supreme Court, which went against him, and declared the claim public property. Meanwhile, Pioch and Co., of San Francisco, got a title to the San Francisco ranche, about 26 miles from Temeschal, and now they are trying before the Land Commissioners to float this grant over the tin mine property."

NEW MEXICO.—Wagon trains with mining machinery and supplies leave Santa Fe for the Ralston Silver Mines almost daily. The region is attracting new attention. A local paper says that the miners around Elizabethtown, on the Cimarron, complain loudly of usurpation on the part of the English company who purchased there. The new silver district about Silver City, Grant county, New Mexico, is creating some excitement. Assays give from $200 to $4000 per ton. Capital and machinery are needed, and large plans for development are going on. These discoveries are within 10 miles of the Pinos Altos Gold Mines, which are now yielding largely. The Santa Rita Copper Mines, 15 miles from Silver City, are at present locked up by a lawsuit.

WYOMING.—Colonies are forming east of the Mississippi, to settle on Cooper's Creek, 60 miles north-west of Cheyenne, to work the extensive coal beds of that region. The Union Pacific Railroad talk of building a rail-mill and repair shops at Laramie, using the Evanston coal and the iron ore found in the Black Hills, not far from Laramie. A correspondent writes—"Within 40 miles from Laramie, and, perhaps, the same distance from the railroad at Cooper's Lake, on a little stream called Rock Creek, rich gold, galena, plumbago, and argentiferous galena lodes have been laid bare. Two companies from Colorado—the Wyoming and the Black Hawk—had prospecters in that section as often last summer as they could without coming in collision with hostile Indians."

NATIONAL CONFERENCE OF MINERS.

A Conference of Delegates, representing the coal, iron, lead, copper, lime, and shale miners in the kingdom, was opened at Manchester, on Tuesday. The Conference was convened to consider the measures affecting the interests of miners which are likely to be introduced in the coming session. About 112,000 miners were represented by the delegates who answered to their names. Mr. Alexander McDonald, President of the association, was in the chair, and the representatives present from South and West Yorkshire were David Moulson, William Silkstone, Isaac Haigh, Samuel Broadhead, John Oldfield, John Normansell (vice-President), S. Robinson, Thomas Smith, and John Dixon (secretary).

The PRESIDENT, in his opening address, said meetings among miners and legislation in the mining interest were not of recent date. Legislation for the miners of at least some portion of the kingdom commenced at an early period. The object of that legislation was not, however, to emancipate, but to enslave. During the reigns of James and Charles laws were passed whose objects were—firstly, to fix slavery or serfdom on the miners; and, secondly, to give the employers power to impose pains and penalties upon the miners if they did not do as they wanted. He believed that one of the main causes why legislation had not been what it ought to have been on behalf of the mining interest was that for a long period people had not got rid of the notion or the opinion that the miner was still a serf or a slave. In 1779 a law was passed to give the miner liberty, but so pertinaciously did the employers cling to their old opinions that another law had to be passed in 1797 to give effect to the law of 1779. Then there was a long interregnum before there was further legislation on behalf of the miner, the first real measure that was passed after that of emancipation, excluding the Truck Act of 1831, being the legislation that was effected in 1842. But that legislation took no notice whatever of the safety of the working miner, and tended simply to correct certain abuses, such as the employment of females and young children in the mines. That measure had as another object the suppression of a very great injustice, or rather a gross social iniquity—the payment of miners' wages in publichouses; and it was also intended to prevent the employment of children under 15 in the working of machinery where human life was concerned. The many explosions that took place about 1849 led the miners to desire that something more should be done, and the result was that in 1850 a Bill was brought in and passed, which for the first time dealt with the ventilation of mines, and under which an Inspector was appointed to see that ventilation was carried out. This Act was, however, very defective in many of its details, and he was of opinion that its defective character was the first thing that very strongly stirred up the miners of the country to active endeavours for the improvement of their position. In 1854 an enquiry took place, and in 1850 another Bill was introduced and carried. The Act of 1855 was a great improvement on that of 1850. While the statute of 1850 dealt exclusively with ventilation, that of 1855 imposed certain obligations upon the owners where the enquiry had clearly brought out that human life was being sacrificed, not through fire-damp, but through certain defects in the arrangement of the mines and in the machinery. But, again, there were defects; and, if he might repeat the expression, it was the defects in the Bill of 1855 that drew attention to the necessity of getting a good working mines Bill. In 1858 delegates from all parts of the kingdom assembled in Ashton-under-Lyne, and it was then determined that an earnest effort should be made to improve the Act of 1855. Another enquiry was asked for, but it was found, from interviews with Lord Palmerston, that the Government was averse to this. A continual knocking, however, at the door of the House led to the introduction of a measure of a very comprehensive character, but it was very much mutilated before it left the House of Lords, so that, although an undoubted improvement on the Act of 1855, it was yet far from satisfactory when it passed into law. During the discussion on the Bill the necessity of having double shafts was pointed out to the Government, and the cry was raised that if double shafts were ordered such a loss would be entailed as to drive the capitalists away, and destroy the trade. However, a Bill was got with this object, and was obtained not so much by any exertion on their part as the fact that the Government were driven to it by the terrible lesson brought home to them in the case of the Hartley disaster. It should be mentioned that the Acts of 1850 and 1855 applied exclusively to coal miners, but with a strong effort the Act of 1860 was extended to iron miners, their belief being that the inspection which was necessary in the one case was necessary in the other. During the discussion that took place, a nobleman (Lord Kinnaird), who, in connection with the mining interest, was worthy of being spoken of with the highest respect, saw the importance of a wide extension of inspection, and in an exhaustive report that was published inspection was recommended, but up till last session nothing was done in this direction.

The history of their agitation since 1860 could be told in a minute. Dissatisfied, they applied to the Government again and again, and latterly a Select Committee of the House of Commons was appointed in their interest. Then came the Government Bill of 1869, containing a provision extending it simply to the ironstone mines and the coal measures. That Bill was withdrawn in consequence of pressure of work, and a Bill with the same application was introduced in 1870. During the session petitions containing signatures amounting *in cumulo* to 103,000 were presented in favour of alterations in the Mines Inspection Bill, and Mr. Bruce withdrew his first Bill and introduced another, extending inspection to all mines throughout the country. The new Bill contained a number of beneficial provisions, but it had some grave defects, and it was to consider these defects, the Bill not having become law, that they were called together. It would be for them to lay before the country their views on the subject, and he would venture to suggest that they should follow out a different course from that which they had pursued on similar occasions. Hitherto they had contented themselves with the simple passing of resolutions at their delegate meetings. They must now get their resolutions endorsed throughout the country. He thought he might say that in that room there was a fair representation of the miners of the kingdom, and in whatever resolutions they might pass as to mine inspection, social laws, or education, they should be strengthened by public opinion, so that the views of the miners might be fairly and fully considered before the Bill became law. Let it be seen that they were acting for a very large portion of the miners of the kingdom, and that they were only carrying out the wishes of those whom they represented. As to the defects in the Bill, the first was the serious omission of any provision as to education—(hear, hear)—and this was what they had been fighting for for 20 years. He thought they could not and dared not, for the sake of the trust imposed upon them, allow such a thing to be done without their most energetic protest. Mr. Bruce and those who supported him excused themselves by saying that national education having become general, it was not necessary to deal with individual cases; but if this argument applied to the miners, it applied equally to other operations where education was demanded and enforced. If Mr. Bruce was right in saying that the National Education Act would make up for the wants in education of the mining population, why did he not introduce a Bill to take education out of the Factory Act—(hear, hear)—that would take it out of the Bleachers' and the Dyers' and the Workshops Regulation Acts. (Hear, hear.) He was sure that if Mr. Bruce dared to introduce and attempt to carry such a Bill he would bring round his ears such an outcry from one end of the land to the other as would drive him and the Ministry of which he was a part from office in a single hour. (Hear, hear.) He hoped their resolution on this point would be clear and distinct, that they would show that they dare not agree to education being dropped out of the Bill. If Mr. Bruce sought to override them on the matter they must appeal to the country. The Bill provided that youths should work in the mines for a certain period, and that each period of employment should not exceed fourteen hours. ("Oh, oh," and "Shame.") To ask a child to work fourteen hours would be simply cruelty under the name of beneficent legislation. If such a provision were accepted by Parliament it would give legal sanction to a parent who was cruel or unwise, or to an employer who was avaricious, to do a foul injury to the rising generation. (Hear, hear.) He thought that for many years their minds had been made up that a child of from 12 to 14 years should not be allowed to work more than eight hours in any one day, and that care should be taken to look after his instruction when he was not at work. (Applause.) Then, as to the nature of inspection, there was no improvement in the Bill whatever, nor had they known any improvement on this important point since 1855. So long as men were appointed as inspectors who were taken from the colliery viewers and so on, and whose sympathies and interests—if he might say so—were entirely opposed to those of the working men, they could not have a thorough and proper inspection. They ought to insist, if a body of men were appointed who were too refined to soil their fingers by going into the pit every day, that there should be sub-Inspectors, who would be perfectly willing, at a reasonable rate, to go into the pits and see that the law relating to inspection was adequately carried out. (Hear, hear.)

A point was evolved last session on which he trusted the Conference would speak out unmistakeably, and which, if agreed to, would be highly effective, if there were a large body of Inspectors. It was that the Bill should contain a clause ordering the registration every day of the exact amount of ventilation in the pit. He did not mean the ventilation at the pit bottom—(hear, hear)—because he never knew a case but one where the men were smoked out at the pit bottom. The great defect of ventilation was never at the pit bottom, and what was wanted was that proper ventilation should be experienced in every corner of the mine, and it should be the duty of the assistant Inspectors, to whom he had been alluding, to keep a daily register of the ventilation, and to see that the ventilation was of a satisfactory character. There should be a heavy summary penalty imposed in the event of the registration not being correctly kept. In this way they would get good inspection, and not otherwise. (Hear, hear.) Then, there was the question of the payment of wages. Mr. Bruce, in his Bill, laid it down that the wages should be paid in the current coin of the realm. For the life of him he could not see that this was a whit in advance of the point they were at 40 years ago, when the Bill of 1831 was passed. They knew very well what the Truck Act was worth, and the revelations that had been made during the last few months confirmed their opinion with regard to it. These revelations had made it clear—what was not unknown to those who knew what truck was—that wherever truck existed it existed to demoralise and debase the working man, while it enriched the employer by one of the most accursed means on the face of the earth. Where men were paid weekly wages there could be no truck shops. With fortnightly wages they could exist, but with monthly wages they flourished. (Hear, hear.) Their wages should be paid weekly, as was stated in Sir Robert Anstruther's amendment in the late Bill, and they should be paid in money alone without advances. (Hear, hear.) Inspectors should see that the system of weekly wages, if established, was properly carried out. He held that this was a right to the respectable employer as well as to the working man, because where an employer, as had been the case in Scotland, made 18,000*l.* out of the truck system—and he believed some of the larger firms in Wales had been getting a great deal more—he did not require to care for other profits at all, and the consequence was that wages were affected, and the good relations that would otherwise exist between master and men prevented. (Hear, hear.)

In respect to the weighing clause of the Bill, he was anxious that the Government should understand that they wanted weighing, and weighing only; and in dealing with the question of compensation for injuries, he maintained that a colliery owner should be made as responsible for accidents caused by negligence or incompetent or unskilful persons as was any railway company. (Hear, hear.) The Trades Union Bill they could only look at as a class, but they were fairly entitled to be heard upon it. They ought to make as strong a representation as possible for the abolition of the combination laws and for the protection of trade funds. It should be made a felony for any owner or lessee of mines to have a store, or to exact poundage from his employees. (Hear, hear.) In conclusion, he expressed the hope that their deliberations would be conducted by that wisdom which had hitherto characterised the deliberations of the Miners' National Association. He trusted they had met on the important question of mines regulation for the last time, and that they all saw the promised land in view. Very much, he had no doubt, would be effected if their counsels were unanimous, and if their opinions were straightforwardly, and, at the same time, respectfully given to the country. (Applause.)

On the motion of Mr. WM. PICKARD, seconded by Mr. D. MOULSON, a vote of thanks was accorded to the President for his address.

The Conference adjourned at the conclusion of the Chairman's address; and on re-assembling in the afternoon the subject of the Mines Regulation Bill was brought under discussion.—It was moved by Mr. I. HAGUE (South Yorkshire), and seconded by Mr. J. OLDFIELD (South Yorkshire), that the conference approve of the clause inserted in the Bill providing for the inspection of all mines in the United Kingdom.—The CHAIRMAN said that no visitation would be satisfactory which did not embrace an inspection of every mine once at least in every three months.—It was stated by the CHAIRMAN and Mr. W. PICKARD that the report as to the Association being opposed to the South Wales colliers in regard to the appointment of sub-Inspectors was an entire misrepresention.—Mr. PENMAN (Fife) said that the Act providing for inspection had been entirely a dead letter in Fifeshire. The colliers in that county had as often seen Queen Victoria as an Inspector. He considered that an inspector who neglected his duty should be subjected to a penalty or immediate dismissal.—Mr. PICKARD advocated an increase in the number of Inspectors, and an official inspection of each mine at least once in six months. He knew that one of the Government Inspectors had written to the Government asking to be allowed for sub-Inspectors in his district, as he could not do the work himself. He believed that a majority of Inspectors were in favour of an increase in the number of Inspectors, and some were in favour of sub-Inspectors.—The discussion ended by the adoption of the following resolution, proposed by Mr. BURT (Northumberland), and seconded by Mr. ASPINALL (Wigan):—"That, in the opinion of this Conference, the present system of mines inspection is entirely unsatisfactory, being alike unsound in theory and imperfect in practice. We would further express our continued conviction that no inspection will be effective, or even possible, without a great increase in the number of Inspectors or sub-Inspectors. We think that every working-place in every mine ought to be inspected at least once in every three months, and

a record transmitted to the Home Office."—A resolution was passed expressing the opinion of the Conference in favour of providing double shafts in all mines.

On Wednesday the Conference resumed their sittings—Mr. A. MCDONALD presiding.

SAFETY OF MINES.—The first business was the consideration of the clauses of the Mines Regulation Bill.—The PRESIDENT said it was generally believed and recognised in mining circles that more vigilance in the management of the mines was necessary, and it was felt that a daily visit on the part of the Inspectors, and a daily registration of their visits, should be made. It should be made imperative on the part of the owner that every owner of mines should, by himself or through his agent, see every mine examined in all its air-ways, and everything pertaining to the safety of the workman, and that a register of such be kept and sent to the Chief Inspector every four weeks, thus making a continual register against the employer if proper care be not taken of the ventilation. He suggested the recommendation of a clause enforcing a penalty of 50*l.* for a false register. Supposing they had an increase of Inspectors, they would visit the colliery not simply when an accident had taken place, but to see that no possibility of an accident could occur.—Mr. CRAWFURD (Durham) moved—"It being the opinion of the miners of Great Britain, this Conference deems it a matter of the greatest importance that more vigilance be used by the mine owners and their managers in the management of all mines by making a daily inspection of the workings, and that it be made imperative to keep a daily record of the quantity of air passing through all the working places, the same to be transmitted to the Government Inspector of Mines for the district every four weeks, under a penalty of 50*l.*" Mr. Crawfurd suggested that something should be done with reference to the educational status of managers. He knew several accidents had occurred through the manager's total want of education.—Mr. WILSON (East Midlothian) seconded the motion, which was adopted.

EDUCATION OF MANAGERS.—Mr. OLDFIELD (South Yorkshire) moved—"That in the opinion of the Conference every person before being appointed to act as managers in coal, iron, lead, and copper mines shall be examined as to competency, and receive a certificate to the effect that he is a qualified person to undertake the duties of manager, viewer, or agent."—Mr. SMITH (Yorkshire) seconded the resolution, and gave an instance where not one of five deputies could read or write.—In the course of a discussion, it was said that the qualifications generally sought by employers was to appoint a man who was a time-server and a good "bully." Ultimately the resolution was made to apply to all men in charge of underground workings, from the manager to the fireman, and that it should come into operation within two years from the passing of the Act. It was also resolved that boards should be formed in all the great mining centres of the kingdom for the purpose of making such examinations.

RESPONSIBILITY OF MANAGERS.—The CHAIRMAN said, strange as it might appear, in some instances there was a difficulty on the part of the workman in getting to know who was the responsible manager, and stood in the shoes of the employer. He mentioned a remarkable case tried in Scotland, where even legal proceedings failed to determine who was the manager. He thought that this was a proper case for legislation, and suggested that at every mine, within one month of the appointment of the manager, the name of such manager should be placed in the hands of the district Inspector.—A resolution was moved by Mr. BOOTH (Ashton) for the purpose of fixing the name of the manager, both by the notice given to the Inspector and also that the name of the manager be placed in the pay-office, so as to be seen by all employed.

PROPPING OF ROOFS.—The CHAIRMAN said in various districts the workmen had to get their own timber, and in some cases not only to buy it but to cut it. A resolution was adopted to the effect that in every case where prop timber was required the owner should provide it, and cause it to be cut and placed near where the workmen are employed. It was stated that in the North of England, where the owners supplied and cut the wood, there was a great comparative freedom from accidents from falling roofs.

SPECIAL RULES OF MINES.—Mr. WILSON (East Lothian) proposed, and Mr. NORMANSELL (Vice-President) seconded,—"That the present mode of framing the special rules of collieries and mines is highly unsatisfactory, and we are of opinion there should be a court of appeal to which the workmen could apply in the event of their thinking the rules at variance with statute law."—The resolution was adopted.

JUVENILE LABOUR AND EDUCATION.—The discussion embraced the subject of juvenile labour in mines, and the education of miners' children. On the first subject, it was resolved on the motion of Mr. SILKSTONE (West Yorkshire), seconded by Mr. PENMAN (Fife),—"That no child be employed under 12 years old, and none more than eight hours in the 24 between the ages of 12 and 16 years old."—In reference to education, it was proposed by Mr. NIXON, seconded by Mr. WILSON,—"That before a child is employed in a mine a schoolmaster's certificate that such child can read and write shall be produced, and that such children should be required to attend school at least ten hours per week, exclusive of Sunday, between the age of 12 and 16."

WEIGHING CLAUSES.—Mr. BOOTH (Ashton) moved the following resolution:—"That for the purpose of ascertaining the true quantity of coal and other mineral produced by piecework or contract, such material shall be duly weighed by the imperial standard weight of the country, and that the weighing-machines be under the Inspector of Weights and Measures." The present system of measurement was generally condemned as unjust by the speakers on the motion, and the resolution was carried.

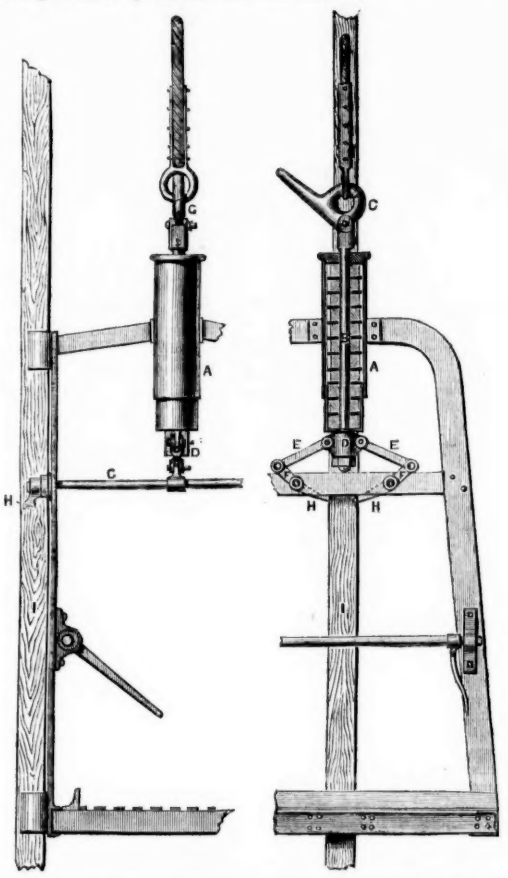
On Thursday the Conference was brought to a close. In speaking of Trades Unions it was held that the late Commission, although it had exposed blots and stains on the system, had done much good in removing erroneous impressions and prejudices in the public mind. In short, it had done more good than harm, by showing they were not so bad as was supposed. A resolution was adopted declaring that any proposed legislation would be unsatisfactory that did not abolish every vestige of the combination laws, and that did not give protection to the funds of such societies. The Conference was agreed in denouncing the truck system, and passed a resolution in favour of the draught of a proposed short Bill, produced for amending the present law for giving compensation to working men for injuries sustained through acts of gross and culpable negligence on the part of employers.

THE INSTITUTION OF CIVIL ENGINEERS.—At the meeting of this society on Tuesday, Mr. Cubitt, Vice-President, in the chair, five candidates were balloted for and declared to be duly elected, including two *Members*—Mr. James Edward Day, Melbourne, Australia; and Mr. Francis Jones, Ex. Eng. for Irrigation, Guzerat. Three gentlemen were elected *Associates*—Lieut.-Col. Geo. Cheseney, R.E., President of the (new) Indian Civil Engineering College; Mr. John William Inglis, Ex. Eng., P.W.D., British Burmah; and Mr. Charles Marshall Poole, Notting Hill. It was also announced that the Council had recently admitted the following candidates as *Students* of the Institution—Messrs. Henry Charles Baggallay, Crawford Peter Barlow, Frederick Stuart Courtney, Thomas Duerdin, Charles Elwin, George Charles Gilmore, Arthur Charles Gotto, Richard Hamilton, William Edward Horn, Joseph Tintorer, and Frederick Thomas Young. At the close of 1870 the numbers of the several classes belonging to the Institution were—16 honorary members, 709 members, 1010 associates, and 201 students, together 1936, as against 1802 at the same date last year, showing an increase at the rate of 7½ per cent. in the twelve months.

THE INVENTORS' ALMANAC.—The thirteenth annual edition of this handsome little sheet-almanac has just been issued by Mr. M. HENRY, Patent Agent, of Fleet-street, and contains, as usual, in addition to the ordinary calendar matter, a large amount of information of considerable interest to inventors and others connected with industrial pursuits. The lists of officers of various scientific and other societies, and of the commissioners and other officials connected with the granting of patents will be found of great utility to many; and the analyses and statistic of patents and chronological table of the progress of inventions, manufactures, &c., will be of very general interest. There is one little table which, in connection with the approaching International Exhibition, is especially worthy of mention. It has been very freely asserted that the public have grown tired of exhibitions, and that, therefore, the inducement to exhibit is much lessened. These views are not borne out by the figures which Mr. Henry supplies, and hence it is that one is disposed to conclude that the decline only refers to workmen's and similar special exhibitions, which have from time to time been projected by those who make a trade of representing (?) the working classes, and with a view to benefit themselves. It appears that whilst there were but 6,039,135 visitors at the Great Exhibition in 1851, there were 6,117,459 at the International Exhibition in 1862, and no less than 10,151,278 at the Paris Exhibition in 1867. Had the 1862 Exhibition been less of a bazaar, it is probable that the numbers would have equalled those of Paris in 1867. The Inventors' Almanac is well worthy of a place in the office of the inventor, engineer, and man of business.

PREVENTING SHAFT ACCIDENTS.

The statistics furnished by the annual reports of the Government Inspectors of Coal Mines show how large a proportion of the deaths resulting from colliery operations are due to accidents in and about the shafts. Of these some are, doubtless, due to the fall of coal and stone, and some result from the sufferers actually falling into them, either from the surface or from levels running out from them; but the breakage of ropes and over-winding are, perhaps, the most fruitful source of danger to life and limb. With regard to the prevention of these accidents, it is frequently urged that the only mode of dealing with them is to induce increased care on the part of the enginemen, and some have even gone so far as to declare that safety appliances of all kinds are objectionable, because they make the enginemen less attentive to their duty, by leading them to place reliance on the automatic arrangements, and thus positively augment, instead of diminish, the number of casualties. This opinion, however, is not universal, and it is not improbable that a really reliable safety-catch and disconnecting-hook would come into very general use, more especially as there is a very ready means of preventing carelessness by inflicting a fine upon the engineman whenever the safety apparatus is permitted by him to come into use.



The annexed diagrams represent the end elevation and longitudinal section of an improved safety-cage, invented by Messrs. TURNER, GREY, and BRYDON, of Barrow-in-Furness, and which seems to possess the great advantages of being free from complication, ingenious, and not liable to get out of order. A spring-box, or cylinder, A, is fitted with India-rubber springs, as shown in the section, so as to form an elastic cushion. A draw-bar, B, attached to the rope by a disengaging-hook, C, passes through the spring-box, and is attached at its lower end to a cross-head, D, to which are connected links, E E, and levers, F F, keyed on to spindles, G G. Also keyed on to these spindles are four sharp-pointed pawls, H H, which, in the normal state of the cage, are held clear of the wood-guides, I I, by the contraction of the springs. Should, however, the rope break the pressure will be removed from the springs, which will consequently expand, and, by means of the cross-head links and levers, force the pawls into the guides, thereby sustaining the cage. The same effect would be produced in the case of over-winding, when the projecting portion of the disengaging-hook would strike against a beam, release the springs, and bring the pawls into play, as mentioned above. The same principle can be applied to guides having wrought-iron ratchet-plates fixed throughout their whole length, or any portion of it; but in this case the pawls, instead of being chisel-pointed, would simply engage in the teeth of the ratchets, and thus sustain the cage without entering the wood.

It will be observed that this is one of that class of safety-cage in which working of the various parts is tested each time the cage arrives at the top or bottom of the shaft, so that it is almost impossible for any derangement that might possibly take place to continue unnoticed. As to whether this principle, or the principle of causing the safety apparatus to remain entirely out of action until an accident occurs, is preferable is a question that will probably remain unsettled as long as colliery operations are carried on; but the majority of opinions certainly seems to favour the testing system. That the wear and tear is greater when the catch is brought into play at the end of each journey cannot be doubted, but against this it is urged that this wear is quite unimportant in comparison with the danger of the catch becoming fixed and worthless by remaining out of use. As it is, of course, impossible to predict the precise moment at which an accident will occur, it is considered a fatal objection to a catch if it is liable to become useless without its failure becoming at once apparent to those about the pit. Messrs. Turner, Grey, and Brydon's cage is not open to this objection, and is, therefore, well entitled to be fairly and thoroughly tested.

PREVENTING SMOKE.—The invention of Mr. D. WALKER, Leith, consists in causing air to traverse piping in the flue leading immediately from the furnace, and then to issue amongst, and mingle with, the fire gases at the back or inner end of the furnace. Numerous plans have been tried for reducing or preventing smoke, in which air has been introduced amongst the fire gases at the inner end of the furnace; and in many of these plans the desirability of heating the air so introduced has been recognised, but such heating has been effected by what is termed "waste" heat—that is to say, either by the comparatively cool gases, after they have traversed the flues through, or in contact with, the boiler or object which the furnace has to heat, or by heat unavoidably radiated through the outer walls of the flues.

INSULATING TELEGRAPH WIRES.—Mr. D. SPILL, Hackney, takes gums, resins, or gum-resins, caoutchouc, balsams, and camphor, as the bases of the compounds, and he combines with one or more of such solid substances one or more of the fatty or volatile oils, oxidised or otherwise, camphor-oil, or nitrobenzole, or naphtha, or ether, either vegetable or mineral, in such a manner and in such proportions as may be found necessary for the purposes of rendering the above-named solid substances permanently flexible and plastic, and, consequently, applicable to the purpose of insulating telegraph wires.

IRON.—Mr. E. F. JONES, Middlesborough-on-Teess, proposes to manufacture iron from Cleveland ironstone in blast-furnaces, by supplying them with raw or uncalcined Cleveland ironstone, either the whole charge, burthen, or load in a raw state, or part of it in a raw state and a part obtained or mixed with other ores.

ELECTRO-MAGNETIC ENGINE.—The invention of Messrs. W. DANIELL and H. LUND, Holborn, relates more particularly to the construction of the inventors' improved electro-magnetic engine and its battery, the principles therein being in a more judicious distribution of electro-magnets, and in arranging in an inner and outer series of such magnets around a circle, the inner circle revolving and the outer series being stationary, and are so arranged in their relative positions that, while revolving, the different groups in the circle become alternately magnets and armatures and magnets and magnets in succession. The improvements in the batteries used in such machines being that of employing double surfaces to the action of the excitants in the usual space or capacity used in such batteries.

FOREIGN MINING AND METALLURGY.

As regards the Belgian iron trade, it may be observed that iron and plates have been the object of a tolerably well sustained demand, but the contracts concluded have been entered into upon rather unfavourable conditions. Forgemasters are endeavouring to occupy their workpeople as long as possible, even if they have to make some sacrifices to do so. Some contracts for rails have been secured, but their importance is not very great. A re-adjudication is announced for the old rails proposed to be withdrawn from the State lines in 1871. The Esperance Collieries, Blast-Furnaces, and Rolling Mills Company will pay, on Feb. 1, its dividend for 1869-70, or 16s. per share. The St. Leonard Company, at Liége, for the Manufacture of Iron, Steel, &c., will pay, on Jan. 6, a dividend for 1869-70, or 2*l.* per share.

The continuance of extremely cold weather has caused an animated demand for domestic qualities of coal in Belgium, and it is expected that prices, if similar cold continues, will exhibit a notable advance. A circumstance which tends still further to harden quotations is the difficulty, not to say the impossibility, of forwarding the quantities applied for, navigations being everywhere closed by frost. Railway communication is alone available, and complaints are heard more loudly than ever as to the want of rolling stock. Industrials threaten to petition the King in reference to the position to which they allege that they are reduced by negligence and incapacity. A meeting of coalowners, forgemasters, and proprietors of ironworks was to take place last week, at Charleroi, to consider the best means of remedying the present state of things. Deliveries of coal to Germany and Holland are impeded very much by the want of plant, and the cavalier fashion in which railway managers attend to the requirements of industrials. If railway plant did not make default in this somewhat extraordinary manner, the commencement of the year would be very favourable to coalowners. The present is the period of the year at which contracts are renewed, and those which expired at the close of December were renewed at previous rates; they might have been renewed for the whole year if extractors had sought to enter into engagements for so long a period in advance, but they have not been disposed to do this, as they anticipate an advance in prices when peace is concluded.

The tone of the German copper markets has been generally rather firmer. The extremely cold weather has rather exercised an extremely adverse influence on communications. The continental tin markets have been generally firm. The deliveries of Banca in Holland last year were 148,815 blocks, as compared with 144,305 blocks in 1869. The unsold stock of the Society of Commerce, Dec. 31, 1870, was 80,079 blocks, as compared with 60,800 blocks Dec. 31, 1869. There is scarcely anything fresh to report with regard to lead and zinc. At Breslau there has been very little doing in zinc.

Advices from Essen (Prussia) state that the aspect of the German Iron Trade is not very encouraging. The past year commenced under the most favourable auspices, and general peace induced hopes of greater activity and higher profits. The rolling-mills—and especially the rolling-mills producing rails—had at the close of 1869 work assured for a long time in advance, while at the same time prices began to advance. The first half of 1870 was very favourable for industrials; the second half, on the contrary, involved them in great difficulties and losses. The apprehensions conceived at first on the outbreak of the war have not, at the same time, been completely realised. The market for merchants' iron enjoyed a great animation at the commencement of the year; the demand was so strong and active that prices advanced without difficulty. During the last six months, on the contrary, orders have made default to such an extent that many establishments have been obliged to send their production into stock. The market for rough iron presented also during the first half of last year a certain diminution; the consumption of the rolling-mills, which were working to their fullest extent, being very considerable. Nevertheless, notwithstanding the circumstance, it was impossible to establish an advance in rough iron. At the commencement of 1870 there were great complaints of want of coke, and the state of affairs became well nigh intolerable towards the middle of the year. Many proprietors of blast-furnaces were obliged to build coke furnaces, or to enlarge those already existing. The price of coal rose during 1870 to an unprecedented point, and at present quotations for coal such as had never before been heard of prevail. The result is, that the proportion between the prices of rough iron and those of coal and coke is so unequal that the blast-furnaces can no longer reckon on a profit, and some producers are expected in consequence to extinguish their furnaces, more especially as a reduction made on the import duties levied on rough iron will check all attempts to establish an advance. The rolling-mills producing rails have had less to suffer from the war than the rolling-mills producing merchants' iron. At the close of 1869 they had sufficient work on hand to last them for six or eight months; last year also brought them some orders, so that they have been enabled to work assiduously and continuously. The annual reports of the great joint-stock works generally indicate an increase in the production, as compared with that of the preceding year. Many works have been enlarged; at the same time orders for rails appear to be now falling off, as the administrations of several railway companies seem to be postponing the completion of their systems. Work has not yet failed, but fears are entertained that this may not continue to be the case. To sum up, the great present drawbacks to Prussian metallurgical industry are—first, the high price of coal and coke; and, secondly, the want of labour.

FOREIGN MINES.

ECLIPSE (Gold).—The directors have advices, dated Dec. 10, from Captain Barratt, of which the following is an extract:—"Our main shaft is looking splendid, and the discovery of silver in cross course or cross lode is of great value. I will give you all particulars concerning it next week."

EXCHEQUER (Gold and Silver).—L. Chalmers, Dec. 12: During the week 5 ft. were made in the main tunnel; 5 ft. of drift in the 50, and a set of timbers put in. The shift stoping from the 80 sent up 6 tons of low grade ore. The windlass men raised 332 buckets of water, and 7½ car-loads of ore, besides 64 loads of dirt. The face of the main tunnel does not look so well as I expected, nor is the ore stope from the 80 coming up to my wishes; but any day may make a change. I have not yet been able to measure the timber sawn, but should think I had from 50,000 to 60,000 ft.

LUSITANIAN.—December: At Taylor's engine-shaft, below the 140 fathom level, the lode is worth 3 tons of ore per fathom. In the 140, east of Taylor's, the lode is 2½ ft. wide. In the 130 east the lode is 4 ft. wide, composed of quartz and stones of ore. In the 130 west the lode is worth 1½ ton of ore per fathom. In the 120 east the lode is 2½ ft. wide, and worth near 1 ton of ore per fathom. In the 110, east of River shaft, the lode is 8 ft. wide, worth ½ ton of nickel and 1 ton of copper ore per fathom. In the 90, east of River shaft, the lode is 5 ft. wide, composed of quartz and stones of ore. In the adit level, west of Perez', the lode is 1 ft. wide, with strings of ore in it. In the 8 west the lode is small. In the 18, on branch, the lode is 1 ft. wide, containing stones of ore. In the 28, west of Perez', the lode is 4 in. wide, and without mineral to value. In the 28, east of cross-cut, the lode is small, and without copper ore. In the 28, west of slide lode, the lode is 6 in. wide, composed of flookan. In the 38, east of Taylor's, the lode is 6 in. wide, composed of flookan. In the 38, west of Taylor's, the lode is 6 in. wide, with stones of ore in it. In the 58, west of slide lode, the lode is 2 ft. wide, composed of country, and strings with copper ore in them. In the rise above the 90, against the winze in the 82, the lode is 4 ft. wide, yielding good stones of ore. In the winze in the 83 the lode is 9 in. wide, composed of flookan, with spots of ore.—Carvalhal: In the 60 cross-cut, north of incline shaft, the ground is a hard gneiss. In the 60, on Great lode, the lode contains spots of lead. In the 70 the lode is 1¼ ft. wide, composed of quartz. In the 20 east the lode is 3 ft. wide, lead worth ¾ ton per fathom. In the adit west of incline the lode is 8 in. wide, with stones of blende in it. In the 30 east the lode is composed of stones of lead.

[For remainder of Foreign Mines see to day's Journal.]

PETROLEUM has been discovered at Cape Breton, Nova Scotia, and the discovery has created quite a *furore*. A company which had been boring at Lake Ainslie "struck oil" on Dec. 9, at a depth of 560 ft., and the oil is still flowing. In consequence of this discovery several new companies have been started to prosecute the industry, and large tracts of land have been leased for the purpose. The petroleum is said to be of high quality. Much complaint is made in Nova Scotia at the dilatoriness of the works of the Intercolonial Railway.

LONDON GENERAL OMNIBUS COMPANY.—The traffic receipts for the week ending Jan. 8 were 8297*l.* 10*s.* 5*d.*

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